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ELECTRIC TOOTHBRUSH

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Patent matches the published, examined application

The invention relates to an electric toothbrush with a driving device, which is housed in the handle housing and which consists of an electric motor, a gear, through which the rotational

movement of the motor shaft is transformed into a back and forth motion of a plunger, and a switch for the electric motor.

The back and forth motion of the plunger carrying the brush is especially advantageous for electric toothbrushes, because it enables effective cleaning of the teeth due to its relatively long stroke. To generate this back and forth motion of the plunger and the brush, there has been the attempt to use a rotating drive, which is formed from a few simple parts and which has been shown by experience to have a longer service life relative to a motor realizing a back and forth linear motion.

In addition, electrical toothbrushes are also known, which have so-called vibrating motors, which are usually formed such that an unbalanced mass is placed on the motor shaft, which generates the vibrating motion of the plunger. Such drives do not have a plunger moving back and forth and accordingly also no gears for generating a corresponding back and forth motion from the rotational motion of the motor shaft. The individual parts of their drive system are installed one on top of the other during the assembly in the handle housing, which presents no special difficulties.

For toothbrushes of the type mentioned in the introduction with a back and forth plunger, there is the problem of guiding the plunger exactly and also performing a precise calibration of the individual drive elements in their mutual positions during assembly, so that a long service life of the device is guaranteed.

The goal of the invention is to create an electric toothbrush, which guarantees simple assembly of the individual elements of the drive mechanism, wherein there is simultaneously the ability to subject the parts to a function test after assembly without impairing access to the parts, e.g., through the handle housing.

To achieve this object, the toothbrush according to the invention is characterized in that the motor, the gear with the plunger, and the switch are arranged on a U-shaped frame. In the U-legs extending from the crossbar of this frame, grooves are formed at opposing positions, in which the plunger is supported so that it can move back and forth.

For the new toothbrush, the entire drive system of the toothbrush, which provides a rotating drive motor, is preassembled outside the housing, wherein a closed unit is produced, which allows the entire mechanism to be tested and calibrated very simply and carefully after the assembly of the individual components, so that for low production costs, a device with reliable operation is produced and which provides a long service life. In the case of maintenance, the drive unit as a one-piece whole merely needs to be removed from the housing and likewise to be replaced, if necessary, by a corresponding replacement unit.

It is advantageous if holding means are arranged on the frame, which can engage the inner wall of the handle housing, so that a fixed, horizontal locking of the frame in the handle

housing is guaranteed. Here, the configuration can be realized advantageously such that tabs extend from the U-legs of the frame and a compression contact tooth projects downwards from the frame on the crossbar side, which secure the position of the frame in the handle housing as holding means.

Especially simple assembly conditions are produced if the handle housing, which is made from deformable, elastic material, is normally cylindrical but can be brought into an elliptical shape for a short time by manual compression so that the drive device can be inserted into the handle housing, wherein the tabs of the frame penetrate into corresponding slots of the handle housing when this returns to its cylindrical shape after the pressure is released.

The drawing shows an embodiment of the object of the invention. Shown are

Figure 1, the drive device defined for an electric toothbrush in a perspective, exploded view,

Figure 2, the drive device in front view, for which the plunger and the gears are illustrated partially in section,

Figure 3, the drive device in a side view, for which individual parts have been removed,

Figure 4, the drive device in a horizontal section along line 4-4 of Figure 2,

Figure 5, the drive device in a horizontal section along line 5-5 of Figure 4, and

Figure 6, the drive device in a horizontal section along line 6-6 of Figure 4.

The drive device 10 consists of a battery charging part 11, a battery 12, an electric motor 13, a switch 14 activated by a ratchet gear, and a plunger 15 moving back and forth. The battery charging part 11 is connected to the battery 12 by the coil holder 16. On its side, the battery is mounted on the motor with the help of the battery holder 18. The battery holder has a spring-mounted, insulated jacket 19, in which the battery is inserted, and on the other side spring-mounted cogs 20, which extend from the battery and engage the motor. These cogs are provided with bent ends 21, which engage in corresponding recesses on the motor. On its side, the motor is mounted on a frame 17 shaped in a certain way with the help of a threaded bolt 39. The threaded bolt 39 goes through an opening in the bottom part of the frame and is threaded onto a projection 51 of the motor extending upwards. The drive device 10 is inserted with the charging part towards the back into a cylindrical handle housing 22. After inserting the drive device, a sealing bellows 23 is attached to the plunger and to the cylindrical housing and in this way, the drive device is sealed relative to the outside atmosphere. The sealing bellows is held by a cap 24 on the plunger and the cylindrical handle housing, which also holds the switch knob 25 in position relative to the switch 14 itself.

The type of support of the back and forth moving plunger in the frame 17 is the following: the plunger 15 has a toothbrush attachment part 26 and two parallel arms 27, which extend from this attachment part. In order to be able to execute its back and forth motion with

reference to the frame 17, the plunger is supported in two U-shaped grooves 28, which are formed in the side walls 29 of the frame 17 running parallel to the axis. To decrease the friction between the plunger 15 and the U-shaped grooves 28, there are ball bearings 30 between H-shaped projections 31, of which two are formed on each of the parallel arms 27.

To produce a back and forth motion in the plunger 15, there is a motion transfer device. The shaft 32 of the electric motor 13 carries a pinion 33, which meshes with a spur gear 34. The shaft 35, on which the spur gear 34 rotates, extends perpendicular between the side walls 29 and is held on each side in holes 36 of the side walls. The spur gear 34 with an eccentric, cylindrical cam 37 consists of one piece. One end of the shaft, which lies in a hole 36, is provided with grooves 38 in order to prevent rotational or axial movement of the shaft. Each of the arms 27 has a slot 40, through which one end of the shaft 35 extends. These slots extend in the direction of the back and forth movement of the plunger, so that the plunger can move back and forth, without the arms 27 striking the shaft 35. The back and forth motion of the plunger 15 in the frame 17 has the effect that the cam 37 interacts with the stops 41 and 42, which are directed inwards and which are formed on the inner side of one of the arms 27 of the back and forth moving plunger 15. The stops 41 and 42 are located only at one of the two openings 40. When the cam 37, driven by the motor shaft 32, rotates, it alternately contacts the stops 41 and 42 and generates the back and forth motion of the plunger relative to the housing.

A line 43 connects one end of the motor 13 to the switch 14. One end of the battery is connected over the line 44 and the line 45 to the other end of the switch. When the ratchet switch 14 is closed, the battery is connected to the motor over a circuit formed by the line 44, the line 45, the contacts of the switch 14, the line 43, and a direct connection between one of the motor brushes to the other end of the battery. The ends of the charging part and the ends of the battery are connected on one side through a charging line 46 and the line 44 and on the other side to each other by the line 47.

When all components of the drive device are attached to the frame 17 and the electrical connections between the battery, the switch, and the motor are produced, it is possible to test the drive device before it is inserted into the handle housing of the toothbrush for whether it is operating perfectly in mechanical and electrical terms. If this testing produces any errors, it is relatively easy to reset the device, because all of its parts are still accessible without any additional means.

For a short time, the cylindrical handle housing 22, which consists of a deformable, elastic plastic, obtains an elliptical shape due to manual compression, so that the drive device can be inserted into the housing. Tabs 48, which project from the side walls 29 of the frame, and a compression contact tooth 49, which projects downwards from the frame, secure the position of the drive device in the cylindrical housing 22. The drive device is inserted into the housing such

that the tabs 48 and the compression contact tooth 49 are flush with the longer axis of the deformable, elliptical housing. The housing is then released so that the tabs 48 penetrate into the slots 50 of the cylindrical housing and are fixed in these slots, while the compression contact tooth 49 contacts the inner wall of the housing at a position, which is diametrically opposite where the tabs are inserted into the slots.

When the drive device has been mounted on the frame, the electrical connections are produced, the test has been completed, and the device has been inserted into the cylindrical housing, now it is necessary only to close the open end of the housing with the bellows seal 23 and the cap 24, which completes the assembly of the toothbrush drive device.

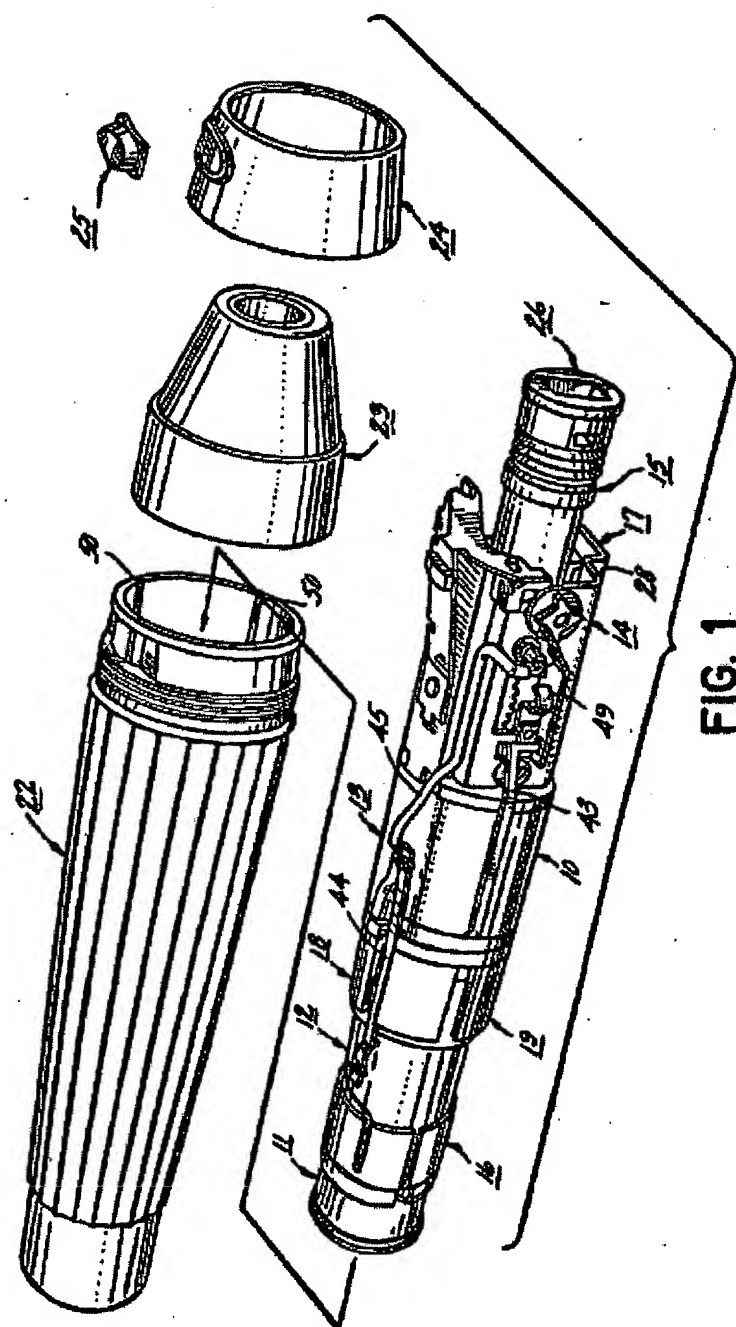
### Claims

1. Electric toothbrush with a drive device housed in the handle housing, which consists of an electric motor, a gear, through which the rotational movement of the motor shaft is transformed into a back and forth motion of a plunger, and a switch for the electric motor, characterized in that the motor (13), the gear with the plunger (15), and the switch (14) are arranged on a U-shaped frame (17), and in the U-legs (29) extending from the crossbar of the frame, grooves (28) are formed at opposite positions, in which the plunger (15) is supported so that it can move back and forth.

2. Toothbrush according to Claim 1, characterized in that holding means (48, 49) are arranged on the frame (17), which can engage with the inner wall of the handle housing (22).

3. Toothbrush according to Claim 2, characterized in that tabs (48) extend from the U-legs (29) of the frame (17) and a compression contact tooth (49) projects on the crossbar side downwards from the frame (17), which secure the position of the frame (17) in the handle housing (22) as holding means.

4. Toothbrush according to Claims 1-3, characterized in that the handle housing (22), which is made from deformable, elastic material, is normally cylindrical but can be brought for a short time into an elliptical shape by manual compression, so that the drive device (10) can be inserted into the handle housing (22), wherein the tabs (48) of the frame (17) penetrate into corresponding slots (50) of the handle housing (22) when this returns to its cylindrical shape after the pressure is released.



**Fig 1**

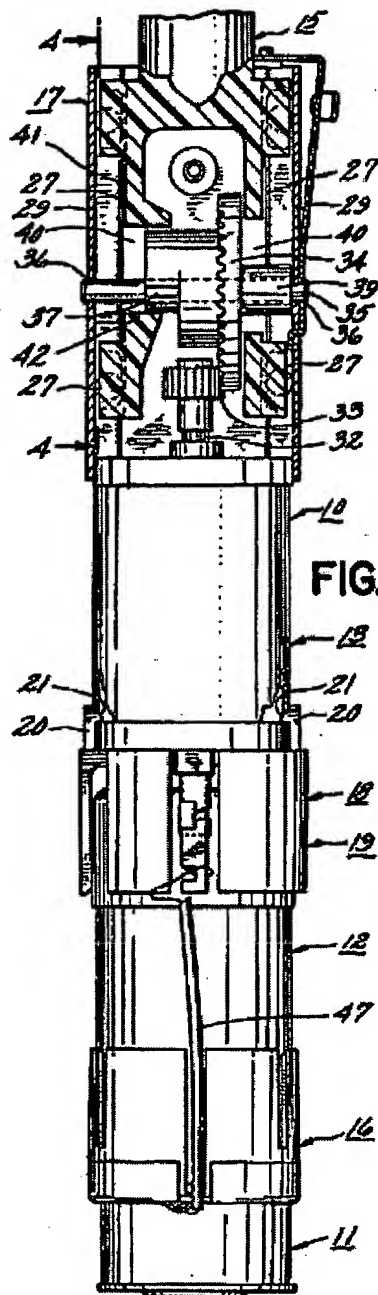


FIG. 2

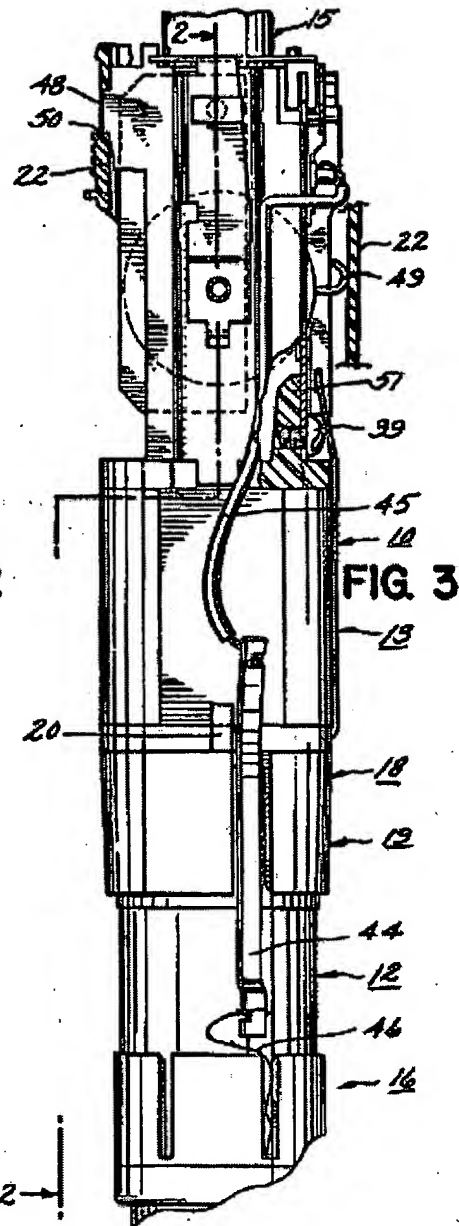


FIG. 3



FIG. 4

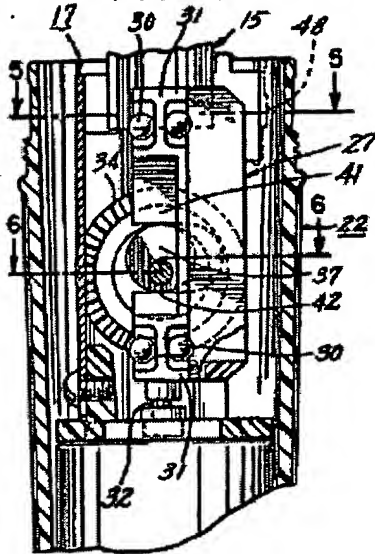


FIG. 5

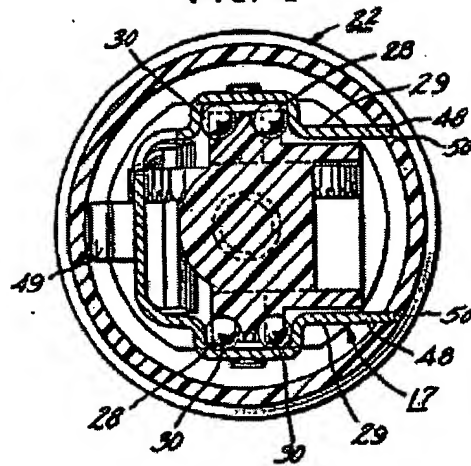


FIG. 6

